RAYTHEON

TECHNICAL INFORMATION SERVICE

Technical Information

CK6922

MINIATURE DOUBLE TRIODE

The CK6922 is a heater-cathode type double triode of miniature construction expressly designed for application in cascode circuits as a low noise broad band RF amplifier. The tube is also suitable as a mixer and phase inverter, or as an AF amplifier. The tube uses frame grid construction which allows closer grid to cathode spacing, thus enabling higher transconductance values to be obtained.

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock–Test) .... 450 G
Maximum Vibrational Acceleration (96 hour Fatigue Test) .... 2.5 G
Maximum Bulb Temperature .... 170 °C

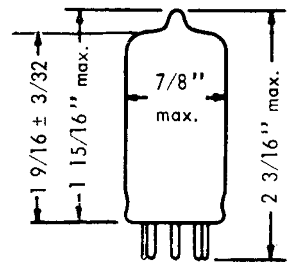
ELECTRICAL DATA

Ratings and Normal Operation	MIL-E-1 Symbol	Test Limit or Absolute Minimum	Normal Test Conditions	Normal Operation	Test Limit or Absolute Maximum	MIL-E-1 Units
			Ratings			
Heater Voltage	Ef:	6.0	6.3	6.3	6.6	V
Plate Supply Voltage	Ebb:	···	100	100	250	Vdc
Grid Voltage	Ecc	---	+9	+9	---	Vdc
Plate Dissipation (per Plate)	Pp/p	---	---	---	1.65	W
Heater-Cathode Voltage	Ehk	–135	---	---	70	v
Grid Resistance, Fixed Bias	Rg/g:	---	---	---	0.5	Meg.
Grid Resistance, Cathode Bias	Rg/g:	---	---	---	1.0	Meg.
Cathode Current (per Cathode)	Ik/k:	---	---	---	22	mAdc
Cathode Resistance	Rk/k:	---	680	680	---	ohms
			Tests			
Plate Current Ebb=91 Vdc; Ec=0 Rk=80 ohms (Note A)	Ib:	11.6	---	15.2	18.9	mAdc
Heater Current	If:	285	---	300	315	mA
Transconductance (1) (Note A)	Sm/p	10,000	---	12,500	15,000	µmhos
Transconductance (2) Ef=5.7 V; (Note A)	ΔSm/p: Ef	---	---	---	15	%
Amplification Factor (Note A)	Mu:	26.5	33	33	39.5	---
Vibration F=25 cps; G=2.5 Rp=2000; Ck=1000 (Note B)	Ep:	---	---	---	100	mVac

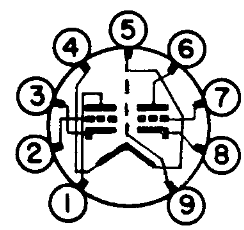
MECHANICAL DATA

ENVELOPE .... T6½ Glass
OUTLINE .... JEDEC (6–2)
BASE .... 9 Pin Miniature
BASING 9DE
MOUNTING POSITION ..... Any

PHYSICAL DIMENSIONS



BASING



BOTTOM VIEW

TERMINAL CONNECTIONS:

Pin 1 Plate, Unit #2
Pin 2 Grid, Unit #2
Pin 3 Cathode, Unit #2
Pin 4 Heater
Pin 5 Heater
Pin 6 Plate, Unit #1
Pin 7 Grid, Unit #1
Pin 8 Cathode, Unit #1
Pin 9 Internal Shield

MINIATURE DOUBLE TRIODE

Ratings and Normal Operation	MIL-E-1 Symbol	Test Limit or Absolute Minimum	Normal Test Conditions	Normal Operation	Test Limit or Absolute Maximum	MIL-E-1 Units
			Tests			
Capacitance (no shield)	Cgp:	---	---	---	1.6	pf
Capacitance (no shield)	Cin:	2.7	---	---	3.9	pf
Capacitance (no shield) Section 1	Cout:	1.55	---	---	1.95	pf
Capacitance (no shield) Section 2	Cout:	1.45	---	---	1.85	pf
Capacitance (no shield)	Cgg:	---	---	---	0.006	pf
Capacitance (no shield)	Cpp:	---	---	---	0.050	pf

SPECIAL TESTS AND RATINGS TO INSURE RELIABILITY

Randomly selected statistical samples are subjected to the following tests:

Shock Test – 450 G. 30° hammer angle in Navy high impact shock machine. Sample subjected to twenty impact accelerations, five impact accelerations in each of four different positions.

Fatigue Test – 2.5 G. Sample subjected to vibrational acceleration of 2.5 G for 96 hours (32 hours in each of three positions). The sinusoidal vibration is applied at a fixed frequency of 50 cps.

Glass Strain – A sample is subjected to a forty eight hour holding period at room temperature. The sample is immersed in water at 97 – 100°C for 15 seconds and immediately immersed in water at not more than 5°C. The sample is then dried at room temperature for 48 hours and inspected for evidence of air leaks.

Heater–Cycling Life Test – A sample is subjected to 2000 on–off heater cycles at the following cond., Ef = 7.0 V; Ehk = +100 Vdc and other elements floating. At the conclusion of this test the tubes will not show open heater or cathode circuits and meet a maximum Ihk leakage limit of 8 μAdc.

Stability Life Test – Sample is operated for one hour to assure initial electrical stability (Δ_t Sm < 10 %).

Survival Rate Life Test – Sample is operated one hundred hours to assure freedom from inoperatives and early electrical instability.

Intermittent Life Test – 1000 hours. Sample is operated with minimum Envelope Temperature of 170 °C.

Note A – Test each unit separately.

Note B – Units connected in parallel.

APPLICATION NOTES

CAUTION – – – To Electron Equipment Design Engineers. Special attention should be given to the temp–erature which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb tempera–ture is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of per–formance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

MINIATURE DOUBLE TRIODE

ACCEPTANCE CRITERIA

The following tests shall be performed:

For the purpose of inspection, use applicable reliable paragraphs of Specification MIL–E–1.

For miscellaneous requirements, see 3.6

Ef = 6.3 V
Ebb = 100 Vdc
Ecc = +9 Vdc
Rk = 680 ohms

MIL–E–1 Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Sym.	Limits, Note 4 Min.	LAL	Bogie	UAL	Max	ALD	Units
3.1	Qualification Approval:	Required	---	---	---	---	---	---	---	---	---	---
3.7	Marking:	Note 21	---	---	---	---	---	---	---	---	---	---
---	Cathode:	Coated Unipotential	---	---	---	---	---	---	---	---	---	---
3.4.3	Base Connections:		---	---	---	---	---	---	---	---	---	---
4.9.20.3	Vibration:	Rp=2000; Ck= 1000 µf; Note 16	---	---	Ep:	---	---	---	---	100	---	mVac
MEASUREMENTS ACCEPTANCE TESTS PART 1, NOTE 3												
4.10.8	Heater Current:		---	---	If:	---	292	300	308	---	22	mA
4.10.8	Heater Current:		0.65	II	If:	285	---	---	---	315	---	mA
4.10.15	Heater–Cathode Leakage:	Ehk=+100 Vdc Ehk=–100 Vdc	0.65	II	Ihk: Ihk:	--- ---	--- ---	--- ---	--- ---	6 6	--- ---	µAdc µAdc
4.10.6.1	Grid Current (1):	Note 2	0.65	II	Ic:	0	---	---	---	–0.1	---	µAdc
4.10.4.1	Plate Current (1):	Ebb=91 Vdc; Ecc=0; Rk=80; Note 2	---	---	Ib:	---	13.5	15.2	16.7	---	5.4	mAdc
4.10.4.1	Plate Current (1):	Ebb=91 Vdc; Ecc=0; Rk=80; Note 2	0.65	II	Ib:	11.6	---	---	---	18.9	---	mAdc
4.10.4.1	Plate Current (2):	Ec=–8.5; Eb=150 V; Note 2	0.65	II	Ib:	---	---	---	---	100	---	µAdc
4.10.9	Transconductance (1):	Note 2	---	---	Sm:	---	11,500	12,500	13,500	---	3,500	µmhos
4.10.9	Transconductance (1):	Note 2	0.65	II	Sm:	10,000	---	---	---	15,000	---	µmhos
4.7.5	Continuity and short (Inoperatives):	Note 5	0.4	II	---	---	---	---	---	---	---	---
4.9.1	Mechanical:	Envelope Outline No. (6–7)	---	---	---	---	---	---	---	---	---	
MEASUREMENTS ACCEPTANCE TESTS PART 2												
4.8	Insulation of Electrodes:	Note 2 g–all; p–all (10 meg in series)	6.5	L6	R: R:	100 100	--- ---	--- ---	--- ---	--- ---	--- ---	Meg Meg
4.10.9	Transconductance(2):	Ef=5.7 Vac; Notes 2 and 17	2.5	I	ΔSm: Ef	---	---	---	---	15		%
4.10.11.2	Amplification Factor:		6.5	I	Mu:	26.5	---	33	---	39.5	---	---
4.10.6.1	Grid Current (2):	Notes 2 and 15	2.5	I	Ic:	0	---	---	---	–0.2	---	µAdc
4.10.3.1	R.f. Noise:	Ecal=30 mV Notes 16 and 18	2.5	I	---	---	---	---	---	---	---	---

RAYTHEON

CK6922

MINIATURE DOUBLE TRIODE

MIL-E-1 Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Sym.	Limits, Note 4						
						Min.	LAL	Bogie	UAL	Max.	ALD	Units
4.10.3.5	Noise and Micro-phonics	Ebb=300 Vdc; Rk=340 ohms; Ecal=100 mVac; Ck=100 μf Rp=10,000; Notes 16 and 20	2.5	I	---	---	---	---	---	---	---	---
4.10.14	Capacitance:											
	No Shield	Note 2	6.5	Code E	Cgp:	---	---	---	---	1.6	---	pf
	No Shield	Note 2			Cin:	2.7	---	---	---	3.9	---	pf
	No Shield	Sect. 1			Cout:	1.55	---	---	---	1.95	---	pf
	No Shield	Sect. 2			Cout:	1.45	---	---	---	1.85	---	pf
	No Shield				Cgg:	---	---	---	---	0.006	---	pf
	No Shield				Cpp:	---	---	---	---	0.050	---	pf
4.9.19.1	Vibration (2):	Rp=2000; Ck=1000 Note 16	6.5	Code I	Ep:	---	---	---	---	100	---	mVac
DEGRADATION RATE ACCEPTANCE TESTS, NOTE 6												
4.9.20.5	Shock:	Hammer Angle=(30)°	---	---	---	---	---	---	---	---	---	---
4.9.20.6	Fatigue:	G=2.5; Fixed Fre-quency; 50 c.p.s.	6.5	Note 19	---	---	---	---	---	---	---	---
---	Post Shock and Fatigue Test End Points	Vibration (2)	---	---	Ep:	---	---	---	---	150	---	mVac
		Heater-Cathode Leakage; Ehk=+100 Vdc	---	---	Ihk:	---	---	---	---	9	---	μAdc
		Transconductance (1)	---	---	Sm:	8500	---	---	---	16,500	---	μmhos
		Grid Current (1)	---	---	Ic:	0	---	---	---	0.2	---	μAdc
4.9.6.1	Miniature Tube Base Strain:		---	---	---	---	---	---	---	---	---	---
4.9.6.3	Glass Strain:		2.5	I	---	---	---	---	---	---	---	---

MIL-E-1 Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Allowable defectives per characteristic		Sym.	LIMITS		Units
					1st sample	Combined sample		Min.	Max.	
ACCEPTANCE LIFE TESTS, NOTE 6										
4.11.7	Heater-Cycling Life Test	Ef=7.0 V; Ehk=+100; Ec=Eb=0 1 min. on, 4 min. off; Note 7	---	---	---	---	---	---	---	---
4.11.4	Heater-Cycling Life Test End Points:	Heater-Cathode Leakage								
		Ehk=+100 Vdc	---	---	---	---	Ihk:	---	8	μAdc
		Ehk=-100 Vdc	---	---	---	---	Ihk:	---	8	μAdc
4.11.3.1	Stability Life Test: (1 Hour)	Ehk=+70 Vdc; Rg=47,000; TA=Room Notes 2 and 8	1.0	Code I	---	---	---	---	---	---
4.11.4	Stability Life Test End Points:	Change in Transcon-ductance (1) of individual tubes	---	---	---	---	Δ_tSm:	---	10	%
4.11.3.1	Survival Rate Life Tests (100 Hours)	Stability Life Test Conditions or Equivalent Notes 2, 9 and 10	---	II	---	---	---	---	---	---

MIL-E-1 Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Allowable defectives per characteristic: 1st sample	Allowable defectives per characteristic: Combined sample	Sym.	Min.	Max.	Units
4.11.4	Survival Rate Life Test End Points:	Continuity and shorts (Inoperatives)	0.65	---	---	---	---	---	---	---
		Transconductance (1)	1.0	---	---	---	Sm:	8000	---	µmhos
4.11.3.1	Intermittent Life Test:	Stability Life Test Conditions; T Bulb= 170°C. Min. Notes 2, 11 and 12	---	---	---	---	---	---	---	---
4.11.4	Intermittent Life Test End Points: (500 Hours)	Note 13	---	---	1	3	---	---	---	---
		Inoperatives (Note 14)	---	---						
		Grid Current (1)	---	---	1	3	Ic:	0	–0.9	µAdc
		Heater Current	---	---	1	3	If:	285	315	mA
		Change in Transconductance (1) of individual tubes	---	---	1	3	Δ_t Sm:	---	15	%
		Transconductance (2)	---	---	2	5	Δ Sm: Ef	---	15	%
		Heater–Cathode Leakage Ehk=+100 Vdc	---	---	1	3	Ihk:	---	8	µAdc
		Ehk=–100 Vdc	---	---			Ihk:	---	8	µAdc
		Insulation of Electrodes g–all	---	---	2	5	R:	50	---	Meg
		p–all	---	---			R:	50	---	Meg
		Transconductance (1) average change	---	---	---	---	Avg$_t$Sm:	---	15	%
		Total Defectives	---	---	4	8	---	---	---	---
4.11.4	Intermittent Life Test End Points: (1000 Hours)	Note 13								
		Inoperatives: Note 14	---	---	2	5	---	---	---	---
		Grid Current (1)	---	---	2	5	Ic:	0	–0.9	µAdc
		Heater Current	---	---	2	5	If:	285	315	mA
		Change in Transconductance (1) of individual tubes	---	---	2	5	Δ_tSm:	---	25	%
		Heater–Cathode Leakage Ehk=+100 Vdc	---	---	2	5	Ihk:	---	8	µAdc
		Ehk=–100 Vdc	---	---			Ihk:	---	8	µAdc
		Insulation of Electrodes g–all	---	---	3	6	R:	50	---	Meg
		p–all	---	---			R:	50	---	Meg
		Total Defectives	---	---	5	10	---	---	---	---

PACKAGING REQUIREMENTS

4.9.18.1.1	Container Drop	(d) Package Group 1; Container Size (B)

Note 1: This value is for operation under fixed bias conditions. With cathode bias, Rg may be 1 megohm maximum.

Note 2: Test each unit separately:

Note 3: The AQL for the combined defectives for attributes in measurements acceptance tests, part 1, excluding inoperatives and mechanical shall be 1.0 percent. A tube having one or more defects shall be counted as one defective. Standard MIL–STD–105, inspection level II shall apply.

Note 4: Variables sampling procedures: See paragraphs 5.3.3 to 5.3.3.4, inclusive of Inspection Instructions for Electron Tubes.

Note 5: A grid resistor of 0.1 megohm shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

Note 6: Destructive tests: Tubes subjected to the following destructive tests are not to be accepted under this specification:

4.9.20.5	Shock	4.11.7	Heater–Cycling Life Test
4.9.20.6	Fatigue	4.11.5	Intermittent Life Test

Note 7: The no load to steady full load regulation of the heater voltage supply shall not be more than 3.0 percent. This test shall be made on a lot by lot basis. A failure or defect shall consist of an open heater, open cathode circuit, heater–cathode short, or heater cathode leakage current in excess of the specified heater cycling life test end point limit.

Note 8: Stability life test: The sampling and testing procedure for this test shall be in accordance with paragraphs 5.3.4.1 (a) to 5.3.4.1 (g), inclusive of the Inspection Instructions for Electron Tubes.

Note 9: Survival rate life test: The sampling and testing procedure for this test shall be as defined in paragraphs 5.3.4.2 to 5.3.4.2.4, inclusive of the Inspection Instructions for Electron Tubes.

Note 10: For survival rate life test, the equivalent stability life test conditions shall be as defined in paragraph 5.3.4.2.5 of the Inspection Instructions for Electron Tubes.

Note 11: Intermittent life tests: Sampling and acceptance procedures for these tests shall be as defined in paragraphs 5.3.4.3 (a) to 5.3.4.3 (i) inclusive, of the Inspection Instructions for Electron Tubes, except that the following subparagraph shall be added to 5.3.4.3 (e); (4) the life test sample from the first lot accepted each month shall continue on life test for an additional 500 hours (1000 hours total life test time). Failure of this sample to meet the 1000–hour life test end points shall result in loss of eligibility for reduced hours testing.

Note 12: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirements will be satisfied if tube, having bogie Ib (± 5%) under normal test conditions, is determined to operate at minimum specified temperature at any point in the life test rack.

Note 13: Order for evaluation of life test defects: See paragraph 5.3.4.4 of the Inspection Instructions for Electron Tubes.

Note 14: An inoperative as referenced in life test is defined as a tube having one or more of the following defects: discontinuity (ref. Specification MIL–E–1, par. 4.7.1), shorts (ref. Specification MIL–E–1, par. 4.7.2), air leaks (ref. Specification MIL–E–1, par.3.2.4.3).

Note 15: Prior to this test, tubes shall be preheated a minimum of 5 minutes with all sections operating at the conditions indicated below. A 3 minute test is not permitted. Test at preheat conditions within 3 seconds after preheating. Grid current (2) shall be the last test performed on the sample selected for the grid current (2) test.

Ef	Ecc	Ebb	Rk	Rg
V	Vdc	Vdc	ohms	Meg
(7.0)	(+9)	(100)	(680)	(0.047)

Note 16: Tie 1 k to 2k; 1g to 2g and 1 p to 2p. Parasitic suppressors of 50 ohms permitted.

Note 17: Transconductance (2) is the percent change in Transconductance (1) of an individual tube resulting from the change in Ef.

Note 18: In addition to the rejection criteria of par. 4.10.3.1 of Specification MIL–E–1, the output shall be read on a VU meter using a rejection limit of 5 VU. Five VU is the meter deflection obtained with a steady state output of 3 Mw from the amplifier.

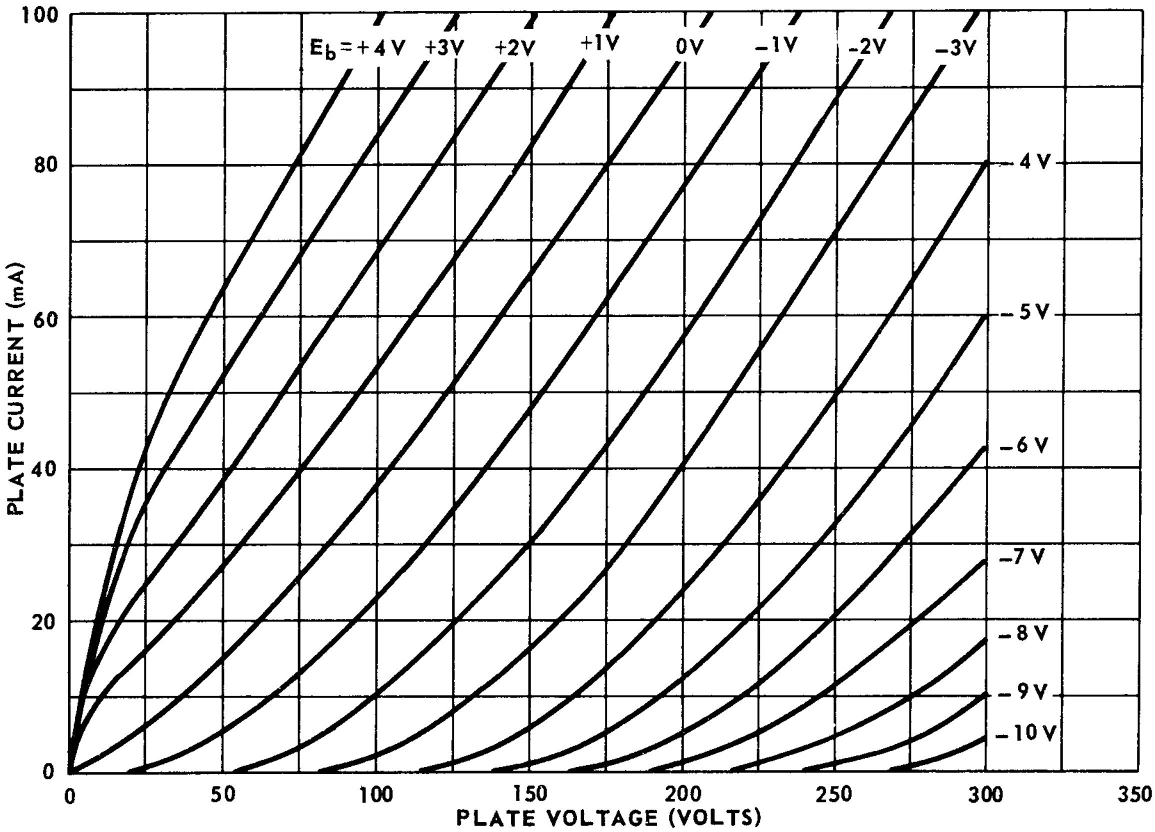
Note 19: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. Once a lot has passed, the 30–day rule shall apply. In the event of lot failure, the lot shall be rejected.

Note 20: The rejection level shall be set at the VU meter reading obtained during calibration.

Note 21: Tubes shall be marked "USN 6922".

MINIATURE DOUBLE TRIODE

PLATE CHARACTERISTICS



TRANSFER CHARACTERISTICS

